

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

MAY 29, 1950



**It's GOOD YEAR
Brakes and Wheels 100%**

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WE think it is highly significant that American Airlines, Inc., world's largest operator of passenger aircraft, has every ship in its Flagship Fleet equipped with world-famous Goodyear disc-type brakes and lightweight magnesium alloy wheels. Because these brakes have proved their superiority for stopping power, safety, dependability, more modern commercial aircraft disc-type brakes than any increasing steadily!



*Dependable
controls cost
less than
service*

CREATIVE ENGINEERING

Makers of the Famous R-4H
Electronic Autopilot, Roll Dug,
and Turbo Supercharger
Controls, Standard on Honey
Types of U-1AF Aircraft

Honeywell
MINNEAPOLIS
AERONAUTICAL CONTROLS

RADIAL LOADS & THRUST From Any Direction



Taken by ONE
Single Row Ball Bearing
(either sealed-for-life or plain)

One easily applied, unit bearing, requiring no adjustment, provides ideal radial support and axial location in both directions for an infinite variety of shaft mountings. If a ball bearing is used at the other end of the shaft, it floats — takes radial load only. Or the other bearing may be a plain bushing, or any radial, anti-friction type the designer may elect. No headaches over shaft expansion or normal machining errors.

Check into this for greatest simplicity and economy in your designs. The famous New Departure "one wheel bearing" on landing cars is an example. . . . Remember — no other bearing not of dual type or not used in opposed pairs can equal this load service.

*Nothing Rolls
Like a Ball*

*Send for booklet: EW showing this application.

NEW DEPARTURE BALL BEARINGS

NEW DEPARTURE • Division of GENERAL MOTORS CORPORATION • BRIDGE, CONNECTICUT • BRANCHES IN ALL PRINCIPAL CITIES

ZERO reader
available NOW for
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THIS ENTERTAINMENT WHICH HAS COINED
train high action from all who
have flown it... the Sperry Zite
Reader... is now available for immedi-
ate delivery after years of flight time.

* Developed by Sperry with the co-operation and encouragement of All-Warrior Flying Devices, Inc., and the Air Transport Association, the Zero Reader greatly simplifies the pilot's job of routine flying as well as making

manual approaches to environmental
Landfill Systems.

• The Zero Reader shows on one indicator... heading, altitude, altitude and instrument landing information... data normally supplied by five essential instruments. By merely keeping the two pointers of the instrument at zero, the pilot has at his fingertips the only normal system approaching the performance of established automatic flight control.

* This simpler technique for flying, navigating and risking makes instrument approaches a much simpler task in the attainment of all-weather operations.

• Our nearest district office will be glad to give you full information.



REPLACEMENT OF THE SUBSTITUTED CATIONIC POLYMER: GREAT BRITAIN, U.K.

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WHO'S WHERE

In The Front Office

John J. "Jack" Kover, chief test pilot for Bellanca Aircraft, has been presented in directing all sales, according to **Charles D. Chamberlain**, who has engaged Kover to stay in his home position. Before joining Bellanca seven years ago, he was a pilot with Eastern Air Lines for three and one half years.

Dr. George Sachs has been named vp. of Hoechst, Inc., as environmental research lab. for plastics industry. Dr. Sachs is well known for his work on the fundamentals of the metallic state and on the properties of boron and non ferrous materials for such areas as aircraft parts, weld metals and cartridge cases.

Amos Ross has been named president of Frank B. Hall & Co., Inc., insurance broker, announcing the late Arthur J. Sullivan. Edward S. Brewster has become chairman of the company's board.

Changes

J. Armon, **Manufacturing**—**Dr. Ralph F. Johnson**, former deputy director of the House Energy Committee's Washington research director, has joined the Harsco Hagler research and development unit as associate technical director. **F. Van Vochten** has been placed in charge of the company's newly organized nuclear department subcommittee section. **G. L. Phillips** has been appointed controller for General Electric Co. as assistant dept. **C. G. Cramer** has been named manager of materials handling and testing divisions of GE's industrial engineering division, replacing **M. A. de Vries**, who has been assigned to act as the manager of the parts division, among the testing division.

Charles J. Ford has been appointed administrator and is in the general sales department of Lead Manufacturing Co., Kansas City, Mo. Ford is a graduate of Western Union Co. Ford himself has been named project manager of Ancon Corp., Carl A. Anderson has been promoted to lead a new assembly division in Minneapolis-St. Paul. Sculpture Co.'s sculpture sales dept. is managed through its sales across the country. Wayne D. Cannon has joined the Executive staff of Lockheed Aircraft Corp. D. Albert C. Hill of SMT has been appointed executive technical director of Bendis, Avco Inc. Research Laboratories.

▲ Around the Airline-John Long is manager of Shaulf Airlines' new office in Denver. Left: Virginia, Don Gable is manager for Panama and Ecuador, Pedro A. Diaz is acting traffic manager in Panama, and Paul Finkston Jr. is new manager at Guayaquil, Ecuador. C. L. Stewart has been

Edward D. Smith has been appointed new human resources manager replacing Randy Spotts who recently resigned.

INDUSTRY OBSERVER

► Wright Aircraft Corp. is coming back into the military engine picture again. Latest deal is sale of \$250 by Turbo-Cyclone diesel engine for the 79 Boeing B-29 four-engine bomber (ask: conversion to be received under the additional 1976 funds to be provided by Congress). Essentially the same powerplant is going on the latest Lockheed Ziv-4 two-engine patrol bomber. (See Page 27.)

✶Avco Canada's jetliner was flown on a single engine for the first time with Trans-Canada Airlines' pilot Al Edwards at the controls for the first time during a seven-minute trial. Flight was made with the No. 5 engine. Indicated air speed was 208 mph at 6000 ft at 14,100 rpm. (Full gas, for takeoff at 14,700) Plane flew at 240-mph, indicated air speed on a later similar trial.

• Jetstar passengers fare will be at least as low as fare on present long-haulers for 400-to-1,200 mi. range—perhaps lower—according to Asia Cargo executives and observers. They estimate that an operator will be able to make more money with this type of craft than with piston engine transports.

* Second Arm Deflector is now being constructed, and should be flying in October. First Deflector has had no engine change for defects after over 100 hrs. of test flying.

• **Valiant Viscount** successfully tested techniques of operating with loss of its four Rolls-Royce Dart turboprop engines and off during its recent 4430-m European demonstration from Owerell fuel consumption was 13,425 gal of kerosene in 61 flight hr., including cross-country and demonstrations. Plane was flown at 24,000 ft. with two-engine descent to conserve fuel. At two demonstrations the Viscount went into a holding pattern because of weather and again used the two-engine operation successfully.

The technique of towing short-range helicopters behind fixed-wing aircraft for long-range rescue missions is being abandoned by USAF. Although towing, as tested at Wright Field, is technically feasible, copiers can be towed only at their relatively slow never-exceed forward speeds. Time can be saved by disassembling the copiers, loading them in transports to landing fields near the rescue locations, and reassembling them. This gives the Sikorsky HO4V a new competitive advantage for long-range missions, since it is designed for quick take-down to be carried in F-105s.

► There were critics: an interpretation in the experimental agricultural plane designed by Paul Ford Wink at Texas A&M College. Sharp-pointed leading edges of the spring-steel leading gear struts would not work for low flying chutes and spruce pilots who occasionally catch their gear in a sharp pull-up out of a field, and might otherwise be catapulted into a crash.

*Fast regular telephony around service on the continent of Europe will be inaugurated with two Bell 477As by Solman on Aug. 1. Service will be under contract with Belgian Post Office. Operation will cover Antwerp, Liège, Namur, Bruges, Liege, Tournai, Hainaut, Breda, Rotterdam and Amsterdam. Lines the terminal at Brussels. Solman's copies cost \$28,000 complete, with VHF communication and mail bus.

• Sikorsk is interested in the speed and payload characteristics of Sikorsky S51-2 for its helicopter road program, now based on five-year experimental plan. But the Belgian carrier will analyze USAF and Navy cooperation with the unit before deciding. Sikorsk sees a big future for carriers in the Congo.

▲ **Air Materiel Command** technicians do not expect to have an electronic air rescue beacon, for incorporation in planes, developed to the stage where it will be ready for production before 1954. Beacon would be a beeping device enabling rescue planes to fly directly to aircraft which was forced down.



*10

EXAMPLE PROJECTS

#4 ADJUSTABLE EXHAUST NOZZLE

Problem:

Before customer's helicopter engine park tests, an in-house fabricated exhaust nozzle.

Solution:

Engineer's in government functional design.

Result:

Desirable test operation with scheduled flight.



Au
unique
sub-contractor
EXPERT FABRICATORS OF
METAL AIRCRAFT PARTS



AIRCRAFT CORPORATION
NEWTOWN, Bucks County, PENNA.

AVIATION CALENDAR

- May 29-31—23rd annual meeting, Aero Metallurgical Soc., Hilton Hotel, Chicago, Ill.
- May 30—Regulatory of South Atlantic of the Association of the International Civil Aviation Organization, and the 6th session of the ICAO legal committee, Montreal, Canada.
- June 1-2—American Society for Quality Control, South national conference with subject conference, Milwaukee Auditorium, Milwaukee.
- June 3-4—Aviation Week, Aero annual convention, Sheraton Hotel, Montreal, Canada.
- June 7-4—Air bus and industrial exposition, Syracuse, Ohio.
- June 8-10—F-4 and Whitney distributor operation and maintenance meeting, Newark Corp., Milwaukee, N.J.
- June 10-13—National Aeronautics Assn., annual convention, Hotel Statler, St. Louis, Mo.
- June 10-13—International auto exhibition, Courmayeur Palace, Brussels, Belgium.
- June 12-14—Mid-year meeting of Aviation Division and Manufacturers Assn., Le Salle Hotel, Chicago.
- June 13-16—Conference on costs, budgets and economics of industrial research, in conjunction of industrial research, Columbia University, New York.
- June 13-16—AEE, annual and Pacific coast meeting, Hyattsville Hotel, Washington, D.C.
- June 13-14—Navy Navy 1973 convention, Citi Club Grand Regency, Honolulu, Hawaii.
- June 22-23—Mid-year meeting of Aviation Division and Manufacturers Assn., Edgewater Beach Hotel, Chicago, Ill.
- June 24-July 1—1973 national meeting of Association of Manufacturers, New Jersey, Calif.
- July 7-8—Bentley Air Force 1970 display, Farnborough airfield, England.
- July 10-24—Age Institute lecture series, Tulsa Air College, St. Louis, Ill.
- July 11-14—Annual meeting of the Institute of Aeronautical Sciences, western headquarters building, Los Angeles.
- July 16—Tenth efficiency conference and show, sponsored by Marshall Aviation Club, St. Mitchell, O.
- July 21-23—Info annual #1000 air tour, sponsored by Cleveland James Chamber of Commerce.
- Aug. 2-23—1973 annual meeting event, Grand Plaza, Texas.
- Aug. 19-20—California Air Freight Club, sponsored by Cold Air Services, Convention and Oakland Chapter of California Airlines Committee, Oakland.
- Sept. 3-14—Research flying display and exhibition, Society of British Aircraft Constructors, Farnborough airfield, England.

PICTURE CREDITS

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International Experts At IATA Meeting (Story starts on page 32)



COMMUNING: Communications Working Group—George R. Perry, IATA; R. J. Kennedy, TWA; A. van den, Fares Foundation; An Fares, also; W. J. McKnight, AVCA, inc.



OFFICER: KLM's Karl Stromme, opens IATA's annual technical conference



SURPRISE: ICAO Pres. Dr. Edward Wiener (right) engine video, with Norwegian Airlines' H. W. Raa.



BEAM: Sir Robert Watson Watt, "father of radar" (center), with E. W. Fenton (left) and H. H. Fenton, ICAO.



MIDDLEMAN: Harold R. Hinkle, general manager, IATA, and chairman of the committee, between Danish Nyrop, CMA (left), and John C. Leslie, FNA vice-president



ON DECK: Adm. Paul H. Smith, U.S. representative to ICAO, talks up

Atlantic Pact Means More Plane Buying

New collective security plan likely to up procurement funds as much as \$3-6 billion.

All signs point to a big step up in military aircraft procurement starting with fiscal 1993 (p. 10). How big depends on planning now in progress. One of the looser now in talks likely to be cut out of the plan.

But the outlook is definitely for one of three possible levels of increase.

- **Integrated defense**—Under the collective security plan adopted last week in London by the North Atlantic Council, top policy priority of the 12 Atlantic Pact nations, the U.S. would accept responsibility for strategic air defense of the western Europe-Canada U.S. community. This plan was championed by the Defense Committee, the second-kind policy group composed of defense ministers, at a meeting at The Hague more than a month ago. Estimates are that it would boost the U.S.'s current \$14.5 billion-year defense bill by \$1 to \$6 billion a year, with most of the increase going to the strategic air arm. Possible expenditure is \$13.5 billion for the U.S. and \$7 billion for European countries.

The 1993 fiscal year budget, still pending in Congress, will include \$1.5 billion for USAF procurement (including guided missiles, electronics, and the \$200 million supplemental security recommended by the administration). The figure also would mean increases of \$1 to \$2.5 billion. Total would then be \$15 to \$5 billion.

- **Reduced Plan A**—12-member Strategic Board, representing the 12 nations of the North Atlantic Council, will soon start functioning permanently in London. Its task will be to shuttle down the cost of the Hague plan as far as possible and allocate cash among the services.

Practical observers here believe that the board, after consideration of the nation's financial limitations, will come forth with an acceptable trimmed-down version of the Hague plan. Achievement of an ultimate goal of a level, affordable and completely integrated western defense would probably be postponed over several years. They estimate that the development will entail a modest increase of from \$1 to \$2 billion in

the combined U.S. defense bill. Most of the increase would go toward the strategic air arm, with some increase in aid to assist European nations build up their forces. Increased security estimate that this development, combined with the most probable, would mean "in no case of several hundred million dollars" for plane procurement in the 1992 fiscal year over the 1991 fiscal year level.

- **48-Group Program**—Even without any look-up of the USAF for its role in such an integrated plan, a substantial increase in plane procurement will be required to maintain the 48-Group Air Force program. And Secretary of Defense Louis Johnston is now committed to this program.

Out of \$2.5 billion for USAF procurement in the 1991 fiscal year budget, \$1.55 billion will be available for new plane acquisitions. USAF has allocated the House Appropriations Committee that to sustain 60 modern groups, an increase of \$175 million, or an availability of \$1740 million, would be needed in the 1992 fiscal year. The program would require \$1780 million in 1993, \$1250 million in 1994, and then level off at \$1200 million as early as the 1995 fiscal year and thereafter according to USAF estimates.

The years immediately following the North Atlantic Council meeting were to firmly commit the 12 nations of the western bloc to a "single" collective military force. That calls for dropping the concept of "holistic" individual national forces. And it sets up the Strategic Board, "with the least possible delay," to function as a "board of directors" to solve this goal.

Under the collective plan, the U.S. will accept full responsibility for strategic atomic bombing. USN also, will have joint responsibility jointly with Great Britain, for Naval power to keep the western open. Continental nations will have joint responsibility for ground forces, and, along with Great Britain, for tactical aviation support. It sets up to an increase in USAF and Naval strength and holding U.S. Army strength at its current level. Men-

while armies of western Europe are to be expanded.

Any collective plan ultimately worked out by the Strategic Board and approved by the North Atlantic Council will still be subject to acceptance and implementation by the 12 member countries before the "single western force" goal can be realized.

There remains some important opposition in Congress to the policy of collective defense. Also there is substantial opposition from the aerospace industry to any increase in the U.S.'s \$14.5 billion a year defense spending.

See Edwin Johnson (D, Calif.), warning the thinking of the administration, said, "I am afraid we are going to be getting money into Europe for another Mideast Lure."

See Phyllis Byrd (D, Va.), economy leader with a reasonable following, commented "I am in favor of coordinating defense, but the U.S. cannot afford to spend any more money than it now spends on arms."

Legislative policies however will probably override these objections and decisions by the U.S. will lead the ball in implementing a final version of the Hague plan. This will require a substantial increase in U.S. defense funds allocated for 1992.

Advocates of the defense spending are pointing out that the overall U.S. budget will be financed by record billion dollars in the 1992 fiscal year, made available to defense by tapping off of Economic Recovery Administration program spending. ECRA's 1991 fiscal year authorization is \$3 billion. For 1992, this allocation will be substantially less. And ECRA is scheduled to close at the end of the 1992 fiscal year.

Science Foundation

The President has signed legislation setting up a National Science Foundation to promote and coordinate basic research. A 24-member Presidential-appointed board of eminent scientific leaders would establish policy and the activities of this foundation would be administered by a \$150,000-a-year Presidentially-appointed full-time director.

The new research authority is \$500,000 appropriated to launch the program during the 1991 fiscal year and up to \$15 million annually after that.

Airline Engineers Told About Jets

In two-day symposium at IATA meeting, operators hear what has happened so far to turbine transports.

By Irving Stone

Admiral Paul N. J. Ainslie, today, one of the two-day symposium at IATA meeting, manufacturers and airline representatives taking their seats to expect in the high-speed, high-speed on the turbine and engine will be long.

Genetics was the turbine-powered aircraft symposium of the International Air Transport Association on May 18-19. The meeting, however, was already determined by Jack J. Dwyer, Vice President of the director of engineering.

Here are some of the things the airline engineers were told they would have to consider:

- **Mid-engine layout** is important because sufficient data on the vibration of mid and temperature with altitude over the entire world are not yet available to make accurate estimates of turbine operation.

- **Operation under long** apparently requires a non-extendable air protection system for moderate conditions, and an extendable system to deal with severe icing, as in desert.

- **Air traffic control** must keep in mind passenger comfort in jet-down. Much of the steep descent (about 4000 fpm)

and gradual takeoff (only from about 200 ft/min) will have to be studied.

- **Landing factors**, including the possibility of the parachute will have to be evaluated for discussion in normal landing.

About 200 representative attendees from 100 airlines met in the symposium which ran from May 19-20 (Page 17). Represented at the symposium were approximately 15 airlines, eight engine builders, ten turbine manufacturers, two power companies and numerous bodies of interest.

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- **Air traffic control** must keep in mind passenger comfort in jet-down. Much of the steep descent (about 4000 fpm)

operation, and over a 2000 ft. stage descent, would reduce reserves 7 or 8 %.

Some highly satisfactory results have been obtained in jet operations. On a recent flight in Africa, for example, information enabled the de Havilland Comet to arrive at its destination within ten minutes of its estimated time of arrival. Similar accuracy has been experienced with the Aero Jetliner.

- **Temperature**, Forecasts-Temperature forecasting will be a vital factor, for temperature frequently is not as accurate as that made, particularly in the early stages of flight. A 15-day-C change at beginning of cruise would require readjustment from 40,000 to 35,000 ft.

At 25,000 ft., it was reported, it is not unusual to get a 12-C change.

And higher temperature rates in the turbojet and turboprop will make turbine support.

The general conclusion was that plus or minus 10 knots and 5 deg. C in the forecasting accuracy makes would like to have. But difficulty is expected in getting this accuracy. Apparently, the higher the altitude, the more accurate forecasts become with past experience.

Johnston, too, said the high altitude, but may not be too serious a factor because the pilot may only have to go 100 ft. above the stream to get out of it. The phenomenon, generally encountered at 20,000-30,000 ft., is as the surface of a strong thermal with vertical air currents of speeds of about 150-200 mph.

The important part seems to be to get to the meteorological is to gather more data events. Location of the storm will cause variation of its location within a recording 60-day period.

Apparently, these air gusts will not be a serious consideration. It was reported that the frequency with which a 1-C gust is recorded would affect only structure, not passengers. Aero Canada engineers claimed that the dynamic response of the structure accommodates the gust effect.

In general, it is felt that there is enough gust data available today for builders of civil turbine craft to cope with the problem. More research is desirable, however, in determining just how effective to make prediction with some degree of accuracy.

It will be important to avoid clear turbulence topside at high speeds, and turbulence powered, craft may require clear-turbulence engine equipment to all in attaining regularity.

It was said that this difference can be reduced-cut at distances of 90 mi. Ground-based radar, reported to have afforded data up to 2000 mi.,



TURBO-CYCLONE IN NEPTUNE

First photo of Wright Aero's new Turbo-Cyclo 10 compound engine installed in a Lockheed F2V-4 Neptune test plane shows one of the engine's three main turbine and exhaust (side view). Initial flights of the compound-engine craft set to have demonstrated status in mid-June.

new, new aircraft types and much less engine cost. Considerable reduction in fuel consumption is also indicated. Turbo-Cyclo 10-2000 F2V-4 is now in production. A detailed engineering story of the new engine began on page 27 of this issue.

could be used to lessen the need for as many radio equipment.

► **Ice.** No-ice program is considered a threat to the integrity of the Arctic region. However, it cannot be assumed that the availability of "liquid" ice, and proper protection for the vessel may take a year in perfect.

Tropospheric properties are problem in no different form on the polar region. Antennae technology and use will be necessary to detect the space on solid flow engine because of the decreased airflow resulting from ice build up. Radio technology will be necessary to the requirement would be necessary.

Both Wilson and General Electric are working with the military to develop satisfactory ice protection schemes.

The GLE representative stated that they were conducting research using natural ring conditions on Mt. Washington, with portable ice ranging from 10 to 30 meters—well beyond the range expected to be encountered. Airtel engine was first to ice up within one minute. Electrical components for the radio series are deemed recoverable, better at may have to be replaced. Hot air engine is being studied for next generation, with regard to the ice case and the island flying. Flying the engine recovery system with a heating pad was avoided well.

► **Ice Solution.** A water method solution is one answer to the icing problem, but drawing of ice for cabin super-charging and heating might make use of the spray technique.

Descent through icing may be made by an operational engine because a descent power would give less heat from the engine and reduced power would decrease generator output for electrical requirements. It would seem that operation would not be as good as a descent unit used up with that time element, because although pilot will attempt to get out of icing conditions as quickly as possible, there may still be serious icing after a relatively long distance.

One engineer indicated that airlines would prefer to have a better flying under-ice protection against moderate icing, without a weight penalty, but would be willing to accept such penalty for additional protection against severe icing as a device.

Let's think about it. There are no clear-cut. Though there may appear to offer solutions to icing problems, actual operating conditions may bring some severe penalties not now foreseeable.

Rain damage is another high-speed operational factor. Since only P-88 experiments showed that rain could penetrate the leading edges of the airframe, the icing, weathering in this location on high-speed aircraft would seem to be ruled out.

ADA reported a half-hour test

series at the onset of a spray dense enough to do it in an instant. But the blood of an aircraft at high altitude is considerably unlikely in any event, leading-edge area thickness would seem to be sufficient to meet low level, and sharper leading edges of high-speed craft would give greater probability of ice-formation detection.

Traffic Control

Trafficking helping characteristics do not differ greatly from those of conventional craft, hence the project probably could continue to present problems.

For the jet pilot, visual control people would prefer a steep descent to raise him passing through other patterns in a gradual descent.

Landing methods proposed: Air Canada and Boeing announced a steep descent from altitude close to the airport at about 4000 feet. The Harland technique indicated that they preferred to begin between about 300 feet. Air Force representative said the craft should be brought in over the area, with sharp landing under radar control.

From consideration in command position, would be to use a steep descent. Airtel and heading angle coming down from altitude would be about 10 deg at 250 mph indicated air speed. The Harland figure it would be about 6 deg.

With the past jet, it is felt that descent below 1000 ft is necessary to maintain 55 to 50 percent of engine power to cope with a go-around situation, rather than adequate representation and more sufficient control for elevated services.

Where there is interference between terminals, jet craft may well complicate the traffic control problem. Present thinking is that there should be a complete arrangement worked out.



GOODYEAR TESTS PLANING HULL

It is felt that the first test of the planing hull concept of NACA's new planing hull, built by a modified Goodyear G-41, showed a significant increase in lift during steep climbs at a steep climb during engine tests of the new configuration. Goodyear Aircraft Co engineers have been testing the new design since

between the group of airlines serving a particular airport.

However, it was felt that jets should not be designed specifically to enter a stack and hold. When it has to, a particular case, a procedure will have to be evolved to accomplish that feat.

Celestial navigation will be practiced at high speeds and altitudes with the industry variant, although some may be slightly greater because of speech in solid.

Antennas

It would seem that for high-speed radio, antennas will have to be improved or made retractable. Some more information before that antennas, in general, can be automated and will work, as well as required, but that they must be engineered into the aerodynamic portion of the aircraft.

Plastic materials present a problem, but it is felt that advanced antennas can be designed for use in installation, provided the user is willing to pay the penalty for undesirable materials and where they will have to be placed.

► **The RF-suppressed antenna** has been found practical on the Conquest. The Harland has about 15 ft of exposure with this installation.

► **Minimax** Warden has already selected ADF with integrated loss.

► **At least** three configurations of VOR, suppressed antenna are working in use at the exposed end.

► **Location suppression** also works in use.

In general, the English test that appeared satisfactory in British test after adequate performance and sensitivity.

Takoff, Landing

It was said that with the turbine plant, jet engine power, if not all the power loss, cannot be tropical time.

perhaps with high altitude may be required with water method region. If injection is not used, the turbine plant is not temperature-sensitive than is the piston engine.

Report was, that at an altitude such as would be encountered at La Foe Airport (over 12,000 ft), the Vancout turboprop with water method approach could get off with 5 percent loss in takeoff weight.

For the Allison turboprop, it was reported that in the 10-100 deg. F range, there is a 10 percent change in thrust per 10 deg. temperature change.

For the Conquest, a 15 deg. C about 1000 ft, runway length is increased 174 percent, without water method approach.

It was also stated that for a 20 deg. C rise above 1000 ft, for a given runway length, 2000 ft of ground must be lifted to get off without use of water method.

Injection figure given for the De Havilland in the 10 deg. F range per 10 deg. C.

Effects of humidity are still not clear.

Airlines Study New Systems

First international carrier technical conference held in U. S. argues value of recent methods and devices.

By G. L. Christian, III

Airline First-International standards union of airlines and airlines represented at the first IATA Technical Conference held in the U.S. Convention from May 9 to May 28 at Atlantic City, N. J., some 150 engineers, meteorologists, and other aviation experts representing 15 airlines from all parts of the world were to the task of establishing world-wide uniformity of procedures, criteria and policies to reach a state of common understanding.

Under the chairmanship of Harold B. Harris, vice president and general manager of American Overseas Airlines, technical change committees, technical working group discussed the problems in the field of engineering, operations and communications.

Engineering

The engineering group, under E. C. Wilmore of British Overseas Airways, considered performance requirements which have been under constant study since the 1944 Chicago international civil aviation conference. Showing high levels of safety plus utmost practicality, the group endorsed the principle of "robustness" performance.

This means that a reasonable, dual, and safety performance must be based on number of accidents that could be probable.

but, should not be worse than with the piston engine. Based upon buoyancy has very little effect on the buoyancy, perhaps beneficial. The British Overseas representative held an immediate effect.

► **Passenger Landing.** One suggestion is that the passenger jet should be equipped with a parachute for emergency use in landing. Device not recommended, by some, for several reasons.

With the B-74 it has been found that time required for operation is 3 sec from passing the release button. Release is about 10 ft above nose.

► **Passenger Landing.** One suggestion is that the passenger jet should be equipped with a parachute for emergency use in landing. Device not recommended, by some, for several reasons.

Use of recent IATO would probably involve probability a night and cost.

It is felt that some form of wheel assisted device is needed, possibly with jets, where there is no prop drag. A spoiler might be used to lift the left, quaking the tail, causing it to give more weight. Another view of using wings over jet operations see page 14.

around a comprehensive study concerning standard operating and maintenance procedures for cabin and passenger aircraft, in special conditions and outside air temperature reductions.

Evaluating the reliability of these instruments is becoming increasingly important in view of the growing emphasis on passenger flight flying, provisions in determining critical instrument status, and the concept of "critical flight."

► **Oxygen Requirements.** The conference also endorsed ICAO proposals that oxygen should be provided for passengers at altitudes above 10,000 ft and for crew members over 30,000 ft, if craft is to remain above that altitude for more than 30 min.

No decision was reached concerning requirements for very high altitude flights.

► **Maintenance Methods.** The program was working group heard reports by H. W. Rice of DSI, as SAS maintenance methods, in 2.1. Dyer of the Trans-Canada Corp. on latest system of progressive overhaul, and by H. Jackson on ICAO's procedure.

Operations

W. A. Scherer, of AOA, was chairman of the operations working group, which report part of discussion was on traffic control.

The objectives of an traffic control system, provided an increased safety, were said to be:

- **Elimination of airborne collisions.**
- **Elimination of collisions during ground maneuvering.**
- **Prevention of orderly traffic flow.**
- **Obtaining latest traffic flow possible, consistent with safe operating conditions.**

A point still unresolved was: Shall planes fly in array or "in the cross box?"

To improve and expedite air traffic control, the following was considered:

- **Standardized phraseology.** Eliminate very unnecessary word and phrases.
- **Clear discipline.** Every crew member must be trained in the highest degree of discipline to follow established route and approach procedures as usually and implicitly.

► **Position Reports.** The conference also IATA standards for position reporting to local, nationwide, airground transmission of weather data and to avoid overloading communication channels.

It specified and suggested sequence to the elements of such reports should contain:

► **Leading.** Able-Representatives agreed that GCA, with an excellent monitoring device, should not provide in rapid response to the pilot, due to their inherent lag in controller reading the



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March, Apr. 1955, \$140

Applied Physics Corp., Pasadena, Calif.
model equipped with laser oscilloscope. Price
\$150. \$400

Arcon Electronics Co., 700 Park St. 2,
Newport, Rhode Island 01840. Price Mar.
1955, \$1200

Atomic Instrument Co., Boston, Mass.
vibrating amplifier power supply. Mar.
1955, \$1000

Browning Laboratories Inc., Waltham, Mass.
oscilloscope oscilloscope. Mar. 1955,
\$1200

Bruck Electronics Corp., New York, N.Y.
oscilloscope. Mar. 1955, \$1000

Cossey & Co., 60, Boston, research lab.
Apr. 1955, \$1200, research lab. \$200, \$100
\$100, research lab. Mar. 1955, \$100

Cummins Engine Co., Columbus, Ohio, vibration
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DeWitt Electronics Corp., New York, N.Y.
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AERONAUTICAL ENGINEERING

Compound Engine Goes into Service Use

First details disclosed
on Turbo-Cyclone now
flying in Navy planes.

By Irving Stone

Throughout aircraft history, speed and range have been prime considerations. But the biggest has been lighted speed to such a degree that new engine developments seeking range have received comparatively little notice.

New range is again brought into sharp focus with Wright Aeronautical Corp.'s compound engine, the TC-15, the latest production model of Lockheed's advanced piston engine, the Navy's PT-24 Neptune.

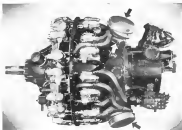
The TC-15 has been brought into focus for the Neptune for the past five or six weeks. It is estimated that with their engines, the Neptune record set by the PT-24 "Tactical Turbo" could have been broken from 11,250 to 15,000 miles (American War, May 19).

Wright Aeronautical has already received \$10-million worth of orders for the TC-15. It is used for Marine P-51M piston engine also.

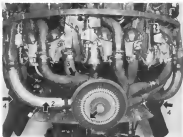
The principle is the only new piston engine to pass a seven-stage test, and first of its type to be put in quantity production and flown in a production airplane. It is a four R-1530 piston engine combined with three turbochargers to provide a compound power source. The compound power source is designed to increase engine output (as reported in the current Air Force) to meet the needs of the Navy's PT-24 Neptune.

This compound engine is reported to exceed these advantages:

- Up to 20 percent less fuel consumption than the best piston engine of the same engine or
- Up to 20 percent power increase.
- 50 percent increase in specific engine weight. Specific weight is about 1 lb./hp.
- No increase in overall diameter. Actual diameter of the compound engine is 55 in. as against 55.62 in. for the basic piston (R-1530). Length of the TC-15 is 91.8 in., whereas R-1530 is 91.91 in.
- No additional controls for pilot.
- Design life—History of this com-



Left side view of Turbo-Cyclone 15. Two of engines show exhaust air down covered with slipping type (black arrow). Vortex (white arrow) not better documented.



Exhaust and piping layout: 1, intake air inlet holes at base of turbine; 2, air duct to turbine box; 3, exhaust exhaust conversion for heat and air cylinder combination; and 4, turbine box; 5, cooling duct exhaust outlet (the other a double type).

compound engine dates back to June, 1946, when the Navy authorized Wright Aeronautical to proceed with a design study of the engine, coupled with performance tests, for two types of aircraft—bomber and attack planes. Meanwhile, the ex-

isting war built and first test stand build was in May, 1947.

Because of a rearrangement of government government activities, work was continued on a low-priority basis (on company funds) for about a year.

The story of the 6-in-1 man

In this day of specialists, we'd like to tell you about a 6-in-1 man. He's a technical adviser, engineer, liaison officer, mechanic, educator, expediter, in one neat package labeled "Chance Vought Field Service Representative".

Wherever Vought airplanes fly, at operations bases, training stations, test centers or carriers, these many-talented field service men are serving in one or more of those roles. They are a most valuable aid to the Navy and Marine Corps in the daily task of maintaining Vought planes at peak efficiency — always ready to fly.

As a combined technical adviser-engineer-mechanic, the field service man is the on-the-spot source of timely facts and figures when a "quickie" is required, as well as during major maintenance and overhaul jobs. As liaison officer, he is the direct link for interchange of information between the operating squadrons and Chance Vought Aircraft. As educator, he conducts classes to keep ground crews abreast of maintenance and repair procedures. As expediter, he keeps to a minimum the time between a demand for spare parts and their installation.

In effect, each service representative is practically a "one-man" aircraft factory. He is a walking encyclopedia of detailed technical information. He knows every rivet and seam, every working part and accessory of

Corsair, Pirate and Corsair fighters. And every day he uses that special knowledge to maintain the 33-year tradition of Vought dependability, availability and fly-ability. To Navy and Marine fliers and ground crews, this 6-in-1 specialist is Chance Vought.

Each of the 24 Vought field service men works at one end of a two-way pipeline that sometimes extends back thousands of miles to the factory in Dallas. They keep tabs on daily aircraft performance, listen to fliers and crews and relay information back home. Their reports are frequently translated into engineering changes that pay off in better operational aircraft. And through the same pipeline the field service department pours a steady stream of engineering changes, service manuals, "how-to-do-it" suggestions and answers to urgent questions.

Periodically, Vought's 6-in-1 experts return to Dallas for refresher courses, adding important chapters to their book of knowledge. For some time they have been making exhaustive studies of Pirate and Corsair jet fighters, learning what makes them tick, preparing themselves to meet the problems that can arise when the planes go into actual service.

The work of our 6-in-1 men really pays off. It helps the Navy and Marine Corps keep Vought airplanes always ready to fly — and at top operating efficiency.

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DALLAS, TEXAS
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Vought field men are great travelers. Using planes, cars, trains and ships, last year they covered 430,000 miles on land and water, in cold climates and hot, in the performance of their job. More than 65,000 miles of this travel was aboard Navy aircraft carriers.



Vought service men are frequently aboard carriers during maneuvers. They're always ready for the loudspeaker call: "Now here this — Vought Service Man, report to hangar deck!" It's a summons for their special kind of help in problems arise during the job of getting planes in A-1 shape for flight.



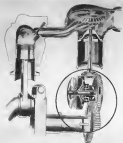
The Field Service Department here in Dallas keeps field men informed of engineering changes and expedient shipment of spare parts. Service manuals are compiled for distribution to military squadrons. Courses are conducted in maintenance and operation of new Vought fighters for our own field men and for Navy and Marine Corps personnel.



The Chance Vought field service man is on duty where he is needed most — where service squadrons are operating.



Drive system: 1, turbine; 2, split shaft; 3, split shaft gear connection; 4, fluid coupling; 5, prop gear; 6, crankshaft gear; 7, prop spline; and 8, crankshaft extension.



Schematic representation showing blow-down turbine and drive mechanism in the crankshaft.



Geological section under study. Turbogenerator uses energy resulting in turbine exhaust.

In August, 1945, an initial order was received for the engine from the Navy. This amounted to about \$46 million.

In July, 1946, a 150-horse engine test was made at the engine power.

In October, 1946, a 50-horse engine approval (ground) test was held. And in the same month, the engine passed a Boeing B-17 flying test later, in an engine engine in the same. In that installation, a turbine drive was used to lead the prop to rotate the air inlet. Thus, in combination with fans, the engine the amount of air to the engine, so that cylinder temperature could be lowered to suitable tropical operating conditions, also to create, airflow conditions resulting from use of shatter in engine operation.

In February and March of this year, a 150-horse AN model test was conducted for final approval.

Cylinder-Turbine Hookup—The basic engine (B-17) has two banks of four cylinders each. To avoid long connecting rods from cylinders to turbine, a simple arrangement was used.

In exhaust pipes lead each of the three turbines. Two front cylinders are connected to a common exhaust, a two-cylinder arrangement is used for two rear cylinders, and another for one front and one rear.

This last combination created a large problem. There was exhaust poisoning because the front cylinder had an over-lapping exhaust. The condition was corrected by an approved hookup between front and rear turbine pipes.

Drive System—The turbine wheel has a mean diameter of about 104 in., and turns at about 11 times crankshaft speed. It is mounted on a shaft leading to a split shaft carrying a 20-tooth gear. This gear connects another 20-tooth gear on a shaft leading to a fluid coupling operating on engine oil. Runner of the fluid coupling is connected to a prop gear connecting another gear on the engine crankshaft.

The coupling links the turbine under load at all times, controls turbine speed, eliminates need of retarding engine and turbine speeds, and isolates the turbine and shafting from vibration forces.

In addition to the fluid coupling effect, the forces transmitted to the turbine shaft cannot be changed by a gear-loaded turbine, plus, arrange gear surrounding the shaft coupling pedestal. The turbine disks are of die-cast material (brass and steel) and lubricated.

Turbine Cooling—This is accomplished by a fan mounted below the turbine wheel, which pumps air (taken from a scoop at the front of the engine) through holes at base of blades.

The air is collected on the left face of the wheel in a cooling cup connected



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Hawanan Airlines selected the WILCOX TYPE 301A COMMUNICATIONS SYSTEM for all aircraft. This system is a 50 watt transmitter at high sensitivity receiver, and a compact power supply and antenna in a separate 10-RT circuit. Transceiver and receiver include frequency selector with provision for 70 channels—single for both present and future needs.

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to a point. This protrudes into the turbine exhaust outlet to achieve an expiring effect for the cooling system and to prevent overheating when the air is cooled with an additional volume.

• Fuselage Dents—The South Aircraft Corporation has found that this new heater might thus do an unusual amount of these dents.

They report no difficulty with the added attachment. If it becomes necessary to replace a heater, the new unit can be welded on, thus the repair costs are reduced on which have been replaced.

In early development testing, turbine wheel operation was possible with as many as 10 to 7 blade tips (all blade sections) running, explaining the new pattern of the design, it is reported.

The evidence was taken up by the spray loaded design plan.

When values based and given went through the turbine in constant stress testing, it is claimed that no design that would accurately simulate that given resulted. And failure of a turbine wheel shaft because of bending caused by an unbalanced air flow in coupling caused an over-speed condition of the turbine turbine, which is reported to have had no adverse effect as the basic engine, except for the loss of power from the turbine. It is claimed that the turbine as wheel did not shatter, and that the wheel was used again for further testing.

Gas velocity at the turbine is approximately 1,400 ft/sec, but since with maximum strength. Wheel speed at cruise is about 16,000 rpm.

Disconnection of the turbine and shaft down to the shaft shaft is backrest by means of an air lock which holds a conventional valve at the base of the turbine.

• Turbopropulsion Possible—Generally, there remains in the turbine engine short coming of the thrust which normally would have been available without compensating.

The FV turbine exhaust stack is a single unit. The Motor PM will still be a double inlet engine.

But since conditions for the TCRS are reported by Wright Aero to be at 10,000-15,000 ft. For higher altitude operation, the present compound air flow could be turbocharged, adding the remaining energy in the exhaust gases. This is being studied.

Other engine manufacturers have also shown interest in compensating the piston pre-combustion Pratt & Whitney is now working on a new version of a medium engine embodying the K-1200 as the base unit. They previously had built a VDT version.







Alison division of General Motors also has experimented with a new power version of the V-12's.



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 <p>Increased Horsepower Belted at Take-off</p> <p>Take-off horsepower rising to new 150 hp at 2500 rpm, providing top speed take-off performance without sacrifice of long cruise life, low operating and maintenance costs.</p>	 <p>Increased Engine Torque, New Beechcraft Propeller</p> <p>Superior steel fold take-off and landing performance is made possible by greater degree of flap used and the greater static thrust of the new Beechcraft propeller.</p>	 <p>Better Landing Gear Action —Both Up and Down!</p> <p>The already quick action of the Bonanza's retractable landing gear has been speeded up even more. At 200 mph the gear locks in 7 1/2 seconds, gear up in 4 1/2 seconds!</p>
 <p>New Upholstery Combinations and Interior Designs</p> <p>New combinations of blue, green and brown materials of stretch and luxury especially chosen to blend with the new range of exterior colors. Super leather seat caps, new seat covers for all passengers.</p>	 <p>New Bonanza VXP Motor: Features</p> <p>The selection of the BSA 116 turbo-reducer is standard equipment provides regular low-frequency operation for propeller, horsepower ratio range, better on-throttle and standard fuel and oil economy, safe, VXP aircraft.</p>	 <p>New Instrument Panel Design, Safety-Type Wheel</p> <p>New instrument panel design retains instrument. Features operating in emergency and emergency, with emergency shut-off air to cabin apparatus. And there's a new safety type control wheel to control!</p>

It has no equal in performance, speed, economy, strength, safety, style and comfort!

The new B35 Bonanza: Bonanza exceeds all previous for a speed with economy plus that's money, comfort, style and ease to fly! New performance features at moderate horsepower add to its security and safety, low operating and maintenance costs at a business economy level!

New operating convenience and luxury appeal from plus acres of refinements call for a personal inspection because there's more here to show only a few see it! Get all the best! You'll agree the greater, the better Bonanza Bonanza is a better than ever value!

Top speed, 184 mph
Cruising speed, 170 mph
Range, 120 miles
Fuel economy, 7.2 gph



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Air Materiel Command's test chamber (left), where packages are "flowed" for safety check. View (right) shows package "light" reaction.

Test Chamber to Aid Air Packaging Design

Container engineers, air shippers and carriers may profit by research being conducted by the Packaging Branch of the Materials Laboratory, Engineering Division, Wright-Patterson AFB, Dayton, Ohio.

The section is special packaging problems are being sought in a new test chamber which simulates flight conditions by reproducing conditions of temperature, altitude and vibration.

The test chamber—a large walk-in vault—can be used to undergo an altitude change from sea level to 50,000 ft. in 3 min. Temperature variations

are accommodated within the range of 165 to -85 F. And a special table will support loads up to 1000 lb. and impose vibration cycles ranging from 600 to 1500 per min.

Presently, the Air Materiel Command is particularly interested in designing proper packaging for "diagnostic" items which it must transport for itself and other branches of the service. These instruments include such hazardous substances as sodium, acids, naphtha, mercury, ether, cleaning fluid and some photographic materials. Though a particular package may be

suitable for surface shipment, it is not always adequate for air transportation. Rusted atmosphere and high altitude could cause corrosion occurring the hazard attached to "diagnostic" items.

Special containers and packaging are prescribed to meet the specific needs for each material. Data packages are generally made of metal, fiber or wood, while cushioning may be cellulose fiber, sponge rubber, Fiberglas, oiled hair or latex. Insulation is afforded by oak, asbestos, or any other medium that will prevent transfer of heat and cold to the contents of the package.

Chief sources of servicing problems are expected to include:

- **Engine flow path fouling**, primarily more severe in cold flow turbines. No completely satisfactory method now exists for cleaning the flow path parts during operation, according to Rogers (Wright-Patterson).

- **Engine case failures**, often by cracking or buckling. The lower sections have to keep the metal skin cool, either by an bleed or waterline cooling. On the metal case, Bailey (Allison) felt that 200 hours of investigative service could be obtained. This was radically substantiated by Disney (Rolls-Royce) who showed pattern of failure in lumens after 400 hours of flight time.

- **Nozzle guide vane failures**, which result from temperature variations and damage from foreign matter. Disney held that operating temperature of the guide vane was the prime limiter for the Dart turbo-prop engine, but knew no improvement with the introduction of hollow vanes of unity contour section, which show improved resistance to thermal shock.

The also felt that as increase in vane life could be obtained at the price of

increased specific fuel consumption and decreased power. Bailey claimed that doing all powered change limits could be obtained without compromise of engine performance or reliability.

- **Assemblies**, such as engine controls, fuel, lubrication and exhaust system, were expected by all to rank high on the list of troublemakers. Complete cleaning, and replacement and reinstallation of the fuel control system topped Rogers' list. Bailey realized similar early trouble on the Allison J13 and J15, but claimed that the present control system is free of major difficulties.

- **Changes in Procedures**—No major changes were forecast to materialize maintenance and overhaul procedures. One section was that 500 hours would be the actual time between overhauls and that base procedures for overhaul would remain much the same as for prior engines.

Bailey claimed that Allison's experience showed servicing of turbine components to be much simpler than that for piston engines. His division's turboservos involved inspection, primarily for the turbine section, fuel and oil filter, and gearbox components. These routine inspections can give a wide reliable and reliable of the engine condition than is possible with piston engines.

The engineers believed that hot maintenance would be confined by its limitations, except for possible replacement of some components on the hot end. As terms of manpower and equipment required, Rogers felt that some replacement in the hot end would be dictated by the relative sizes of the components.

Rogers work will generally mean engine removal. Typical repairs would include replacement of bent-distorted parts and components whose elongated dimensions indicate a limited remaining life.

Assemblies would be completely bench checked, or perhaps tested in for replacement.

These repairs may be made, it was agreed, with a relatively small expenditure in both man-hours and used for special tools. Although some new overhaul facilities, such as a high speed spin test pit, will be needed, the complexity of such equipment is not expected to exceed that required for piston engine checking.

Rogers predicted the use of a trouble-shooting test gas which could be connected into the engine system to duplicate all operational signals for any required electrical and mechanical checks.

- **Cost Factors**—Actual data on maintenance and repair costs were not available, but some comparisons were made with existing piston engine requirements. Normally, however, there

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Alcock High Tension (insulated) Cable (also AN 10-46, AN 118 and AN 111) Specification AN 111 (also in commercial standards)

Specify wire by Specification AN 10-46 and commercial standards

figures represented the best options available. But it was overshadowed by Dwyer that there was the ever-present risk of being forced to cut one's words at a later date.

Total life of turbine engines in 1955 was estimated at 280 hours. An additional life of 1500 hours with these overhauls was estimated by Rogers, with the further comment that more than three overhauls would be made eventually.

The upper limit of the number of major overhauls permissible would be set by tolerance limits of the hot end components, such as intolerably high temperatures in the after several months of the equipment.

An estimated labor requirement of 150 to 300 man-hours per overhaul of turbine-type turboprops was also advanced by Rogers.

Production line methods, he felt, would further reduce this number by as much as 70 percent. (A typical large piston engine currently requires about 400 man hours per overhaul, using production line techniques at the manufacturer's plant.)

Rogers estimated that cost of the first turboprop overhaul would equal about 10 percent of the initial engine cost, with the second and third overhauls not much more expensive.

Dwyer thought that first overhaul cost of the first (turboprop) would be about 20 percent of the first cost of the engine. In perspective, difference between the figure and Rogers' estimate probably is due to savings at the repair place, gear reduction required with a turboprop.

► **Part Costs**—These are disregarded on the cost of replacement parts for turbine engines as compared to piston units.

Rogers' opinion was turbine engine replacements would be no earlier and probably less often—than piston engine replacements.

Bader presented data for Allison's J-35, J-35 and F-1170 engines showing that the cost of replacement parts for the J-35 was some 25 to 30 times that for the F-1170 units.

Bader's figures, however, were of cost to reflect parts price based on compressible propeller thrust. Moreover, Rogers' estimate was a propeller thrust for 1955 transport engine while Bader's data came from actual test performance figures.

Another factor affecting the cost picture is the availability of parts. As a specific example, 41 percent of accessible parts for the J-35 require no suitable in excess models. This reflects directly in reduced cost of spares through the use of production tooling and manufacturers' spare materials and supply practices.

AVIONICS

Ticket Machine With a Memory

Electronic reservation unit being built for American Airlines gives instant data on system-wide bookings.

An ingenious electronic reservation console is under construction for American Airlines by the Teleprinter Corp., New York City.

Known as the "Reservation," the device is developed from a patent for radio wave electronic systems which the airline has held for some years.

A pilot model, in use at Boston for more than four years, has enabled American Airlines and Teleprinter's engineers to forestall many of the original difficulties of the unit. They feel so confident that the current model will be trouble-free.

No Human Error—Use of the Reservation is supposed to result in better passenger handling at ticket counters, shortened telephone conversations for reservations, and the elimination of human error in accounting for millions of airline seats.

Ticket and reservations agents will be able instantly to obtain space availability information and book passage on flights throughout the system. The machine will do the bookkeeping, maintain its statistics and provide availability data on more than 7,500,000 seats on 10,000 different "legs" of the company's flights and some connecting services.

Much of the reference material now needed to permit an agent sale will be eliminated. Information on routes, arrival and departure times, fares, extra sections, overbookings, extra flights and other data, can be determined directly by the agent.

At the peak of five buttons and the flip of a switch, a sale can be made and space confirmed on a small fraction of the time now required to handle the request by telephone.

► **Power a Passenger**—Total cost of the Reservation will be approximately \$140,000. However, since its cost plus operating, maintenance, replacement and maintenance charges will be less than one cent per passenger, (a saving of about one-third the cost of printing overhead) the machine should save \$40 per passenger over its expected life of ten years, assuming a 60 percent utilization.

The equipment consists of a centrally located "master unit" which, with the "terminal" and interconnecting impulse unit, occupies 24 feet by 2 feet by 7 feet, and is more agent seats as required.

by ticket counters, telephone rooms, train centers and possibly even travel agents.

Agent equipment is 9 inches wide by 14 inches long while the chief reserve book agent's unit is twice as wide since it will be used to sell one or more flights from the machine and will be able to read all information stored in the Reservation at any time.

► **Room for Expansion**—The Reservation will be capable of handling planes with a seating capacity of 125, which maximum can be increased by means of a simple adjustment.

The first installation will be made in the New York-Newark area, and will be placed in operation next year.

Antenna Research Aims at Compactness

Miniaturization is being stressed in fundamental research on fluid-mounted cavity antennas being carried out at the Standard Electronics Research Laboratory, Standard Oil. The program sponsored by the USAF.

A cavity resonator is a hollow enclosure whose geometry is such that electromagnetic waves are reflected in a phase relationship which increases their amplitude.

Although the general theory of such antennas has been known for many years, practical application has awaited the development of techniques for the generation of very-high and microwave frequencies. This development was partly accelerated in World War II.

One specific design concept in the miniaturization program is that a cylinder of 14 in diameter and 13 in height. A rod and disk assembly protrude from the cylinder entrance. The whole device can be filled or coated with a dielectric.

Testing of these antennas is being done with a series of aluminum hemispherical resonators, an experimental technique which is the subject of research. These have been used for the antenna, which has been mounted on a flat metal table, and used reflection of the transmitted wave is obtained. From phase and amplitude measurements, in addition, bandwidth and efficiency of the antennas can be determined.



IT'S PESCO ON THE AVRO JETLINER North America's first jet passenger plane

Designed to cruise at 450 m.p.h. at 30,000 feet, the new Aero Jetliner of A. V. Roe Canada Limited promises to be one of the swiftest, quietest passenger airplanes ever to fly the skies.

The four Chevrolet jet engines, installed in pairs, and each rated at 3000 lbs. static thrust at sea level, can push this huge, 30-ton, 50-passenger plane up into the air at a climb rate of 6,300 feet a minute... faster than most World War II fighters!

To take fuel, and lots of it, to deliver this kind of power, and four Peco fuel booster pumps, one for each engine, make certain that no engine ever goes hungry for as full share of kerosene. Peco vacuum pumps and a Peco oil separator are other Peco units on this luxury-making passenger plane.

Over seven guaranteed power and controlled flow of fuel brought greater safety, automatic operation and finger-tip control in aircraft, Peco skills and craftsmanship.

step have been providing the precision-made fuel and hydraulic pumps and controls that are now standard equipment on all types and makes of planes. It is experience and know-how that can help you.

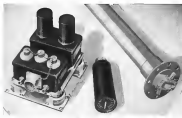
Other Peco Equipment for Jet Planes

1. High Pressure Fuel Pumps
2. Fuelizer Relief Valves
3. Pressure Relief Valves
4. Electric Motors for Fuelizer Venturiators, Solenoid Motors, Windmill Motors, etc.
5. Landing Gear Operation
6. Engine-Driven Hydraulic Pump Systems
7. Electric Motor-Driven Hydraulic Pumps
8. Electric Motor Actuators
9. Engine-Driven Hydraulic Pumps
10. Alarm-Driven Emergency Hydraulic Pumps
11. Alarm-Driven Fuelizer Booster Pumps
12. Hydraulic Flow Transducers
13. Hydraulic Pressure Sensing Valves
14. Hydraulic Pressure Relief Valves



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NEW AVIATION PRODUCTS



PACATRON consists of bridge collector and amplifier passed by plug-in connection, hermetically sealed indicator unit, and tank unit (right) which signals the amount of fuel available.

Fuel Measured With High Accuracy

Claim Pacatron minimizes errors due to change in fuel, irregular tank shape, temperature variation.

A new laser-driven capacitance-type fuel gauge, designed to give previously unattained accuracy, in measurement of fuel by weight, has been developed by Sennecord Associates, Inc., Torrington, N.Y.

Errors caused by variations in test pressure, type of fuel used, flight attitude, and difficulties in measuring fuel content in irregularly shaped tanks are minimized, the maker claims.

Sennecord calls the new gauge the "Pacatron." It consists of a radio-driven voltage dividering fuel gauging in pounds a bridge collector, amplifier, tank unit (transmitter) of variable capacitance, and two secondary units—a fuel capacitor which controls the use of various fuels and a potentiometer which indicates total fuel.

"These devices are used to be the first of their kind to be added as part of a fuel quantity measuring system," Sennecord says. "Use of the fuel capacitor has become mandatory because of the wide range of jet fuels now used, while the tank unit will be required only for certain types of installations."

► **Advantages**—Sennecord claims these advantages for its equipment:

- Tank and gauge have output regardless of tank geometry.
- It is the first capable of operating after auxiliary devices such as high- and low-level warning lights, fuel heaters

pumps, heaters and counter-type indicators.

► **The high-voltage resistor tube** has been characterized, damp away with a constant source of trouble, and reducing to one the number of vacuum tubes needed.

► **Separate amplifier** is designed for speedy replacement with no effect on calibration.

► **Continuous Reliability**—The Pacatron system operates on the principle of a continuously balanced bridge circuit in which the capacity of the tank unit is constantly compared with a fixed capacitance reference resistor. The voltage ratio resulting from the difference in capacitance is then amplified to operate a radio-driven potentiometer which actuates the system to balance.

Since fuel quantity is sensed by the tank unit, detection of the position of the potentiometer wiper, as indication of the fuel quantity is provided by an indicator potentiometer attached to the potentiometer shaft.

The tank unit incorporates contact ring resistor elements which are separated by a relatively large air gap, and surrounded by a grounded shield to remove effects of stray capacitance.

► **Linearity**—To obtain a linear reading in terms of angular degrees against fuel content in irregularly shaped tanks, Sennecord has employed the linearization

technique. In this process, the most electrode of the tank unit is made of an insulating material. A film of aluminum is applied to the tubing in a manner which provides continuous with tank geometry.

Close adjustment of the tank unit to permit interchangeability is made possible by constructing the connecting elements, or electrodes, with helical depressions of equal pitch. When one of the electrodes is rotated by the adjusting screw at the top of the tank unit, the relationship between the helical depressions is altered, thus raising capacity without affecting overall linearity of tank unit.

► **Maps Fuel**—A major "first" claimed for the Pacatron is the fuel composition. This unit is one of the first to be able to measure high flexibility in the system. It is a connecting circuit designed to offset relatively high errors caused by use of fuels other than those for which the system is indicated. The compensator enables the Pacatron to measure fuel units over a wide range of jet fuels through a temperature range of -54 C to 71 C. Sennecord says accuracy of measurement with this device is within 1/2 percent.

Pacatron system, calibrated for one specific fuel, could give a reading as high as 11 percent in error if another fuel was used, according to Sennecord. Although it is now listed in optional equipment, and the most important of new developments in the Pacatron system is the Teflon unit. This device is designed for operation of equipment which must depend on a signal representing fuel level quantity. Light-duty non-indicator, for instance.

The unit is capable of adding individual tank signals in correct ratio and any combination of individual signals can be arranged as to the first indicator reading.

The tank unit combines readings from four input channels and displays their sum on the motor-driven indicator.

The Sennecord unit employs a 2-phase motor which operates 2 potentiometers, two switching contacts and the pointer through a gear train. Also included is a standard equipment on the indicator is an additional output potentiometer, normally used for holding up high and low level switches. Indicator is hermetically sealed and filled with an inert gas.

Amplifier and bridge collector are joined by a plug-in connection which is guaranteed to keep an accurate bridge transformer, accurate condenser, empty oil, and other adjustments and the range indicator unit. Clock-reversing sensing caps provide empty and full adjustment controls and range selector switch located on cover of bridge collector.

cents per ton-mile in fiscal 1946 to \$1.17 in the 1949 fiscal year, the feeder rate increased from \$17.22 in 1946 to \$38.46 in 1949, and the international rate and rate received from \$37.75 in 1946 to \$22.09 in 1949.

- **Surface carriers received 77.1 percent of domestic first class mail as an average of 11.4 cents per ton mile in fiscal 1949, and some receipts received 17.75 cents per ton mile.**

United Will Stick With Its DC-3s

United Air Lines, potentially the biggest domestic carrier for payload, two-engine transports, says it still has no replacement plan for its 63 DC-3s. "We have no fit DC-4s today, so we don't need more speed or size," claims UAL President W. A. Patterson. He says the DC-3 still fits service requirements on schedules to intermediate cities. New transports coming aboard \$500,000 each could save only a few minutes on short hauls even though their cruising speed might be nearly 100 mph faster than the Douglas.

• **Unprofitable Transair-Patterson** claimed that UAL's DC-3 continuing as not profitable. This, he declares, is not because of the DC-3, as such, but because of the tariffing it serves.

• **Raised payload** of 63 Martin 4-0-4s by Eastern Air Lines and TWA left United as the only DC-3 carrier. Transporter still without DC-3s applications.

UAL also declared that it does not plan to use its Superstrans in domestic service unless there are changes in the competitive or economic situation. The company hopes to get increased mileage from the Boeing as its West Coast-Boston run, especially if it receives a Los Angeles-Boston link.

In response to stockholder's question, Patterson declared:

- **Transporters** probably will not be obtainable in quantity for at least two years. UAL would favor buying enough turboprop engines to equip one DC-6 for cargo service. The domestic jet transport may still be at least five years away.

- **Freighters** using the same ponds as United, and using the same equipment (DC-3s), receive 40 times as much mail per Douglas than United. UAL will not capex as any activity definitely designed to improve the carrying of freight now existing. United opposed establishment of freight, citing that economically unfeasible, and that it would have the short-haul carrier as CAB's responsibility.

• **However,** despite misleading publicity, has still not proved itself as a non-mono-culture. UAL trades have continued to show consistent benefits of ex-

cessive competition in the second field, but the company is prepared to enter the transcontinental coach business in a matter of days if faced to do so by competitive conditions.

- **Trans-Atlantic competition** is so stiff that United is grateful every day that it did not enter the field. "This a confession by the fact that American Overseas Airlines cannot quite manage to sell out to Pan American."

- **Pilots per order** are justified, and \$10,000 a year is not "usually too much," as argued by one stockholder. "It is would not affect our of sufficient value to the public, and it would not result in even losses to stockholders." Because of his experience for human life the pilot is in the same professional category as a doctor.

England-New Zealand Race Entries Filed

Contributory International Air Race Council, sponsors of a 12,000-mile England-Churchchurch, New Zealand, course scheduled for October, 1951, says four international entries have made successful entries at the latest preliminary section of the event. They are British European Airways, British Overseas Airways, KLM and American Overseas Airways.

The council said entries competing in the transport handicap section are likely to be three planes in New Zealand with full loads of tourists. Two British manufacturers, de Havilland and Armstrong Whitworth, reportedly will participate in the transport handicap section of the race, the latter firm recording entry of its Apollo turboprop engine.



FREE TELEVISION LURES CUSTOMERS

Central Airlines, the new leader among airlines from New York, has opened the sales merchandise drive of a television set, available at an instant counter. Set is clearly visible to passengers, and attracts attention to Central's new service. The air-

MATS' Peacetime Mission is Training

Military Air Transport Service's peacetime mission—putting elite pilots on training routes from maintenance of scheduled airframe operations—has been announced formally by the Department of Defense (Defense Weekly News 24).

Gen. Hoyt S. Vandenberg, USAF Chief of Staff, said MATS would discontinue scheduled transport service between the U. S. except for an occasional and such training cargo operations as may be found necessary. The continuance or reduction of scheduled flights to South American ports is also planned, but in general MATS will continue its airframe service.

- **Let Incocon**—There will be no cut in MATS' present role capabilities in fact, will be available to the Defense Department will receive during the first fiscal year an additional cargo aircraft and larger planes (C-79s and C-124s) because available.

Almost 75 percent of the by-product aircraft produced as the training mission will be available to the Joint Chiefs of Staff for carrying armed forces cargo and personnel. Indeed of MATS' training flights will be strictly local as never.

MATS' assignment is based on an efficiency survey made by the Defense Department's management committee during the past six months. While MATS' personnel will be cut between 10 and two percent, the Defense Department believes the change in mission will permit more rapid and effective expansion to meet MDA requirements.

Italy's Carriers Are Hopeful, Makers Sad

Italian airplane manufacturers are reflecting from a headache that will still take some time to cure.

• **The headache**—Lillo Bonanni, director of aircraft production, signed the memorandum of military order, and the great of major Allied planes sold to the government and private airlines since the war's end.

• **The remedy**—A long-term Italian government program facing the industry definitely order covering a specific number of years.

- **Transport**—Last-Italian transport line now 16 four-engine, 15 three-engine, and 10 two-engine civil, the majority of which are American built. Seven additional foreign-built aircraft have been ordered from abroad. There will be no cut in Italy's present fleet of 100 civilian planes of all types. It is with the limited fleet that the airplane manufacturers must deal, although customers are being sought in Spain and the Middle East.

United Italian production has a good reputation and payment can be made in Italian currency.

- **Can't Look Ahead**—There is more optimism in the transport sector. Lines Aer Italia plans to negotiate its Rome-New York, Los Angeles, and London flight this summer with these DC-6s. LAI, alone of Italian airlines, has posted a profit during each of the last four years. In connection with Trans World Airlines and some of TWA's facilities have played a part in it.

• **Other Plans**—Aviation Italiana International (Alitalia) has purchased Douglas Superjets for use in its South American service. Plans are underway to equip with Lines Aer Transatlantica (LAT) Boeing (LAT), with a view to replacing the service. Service to West Africa is due to be resumed in the near future.

Alitalia is 60 percent British-owned. LAT is a trans-Atlantic airline operation working tentatively between Rome and Canada.

DC-4s are also scheduled to replace Alitalia's four Avia Lombardas being used in its South American run. The company has recently transferred five of its DC-4s to the Italian Air Ministry.

- **LAI Lines**—Alitalia Air Lines (LAI) are running two DC-6s from Douglas at a reported \$24,000 per month for each to be used in the service of the heavy Italy DC-4 traffic, while awaiting delivery of the DC-6s from the United States where they have been on order.

- **Age Folds**—Avia Express Co. is planning to start up a C-47 and Capital a single of 37 million lire. The company has light transport and aviation services, and also has an aviation school.

Canadair Studies Turboprop Transport

Canadair, Ltd. at Montreal, largest Canadian aircraft factory, has started development on a turboprop transport, as assistance to its North Star version of the DC-6 Douglas transport.

Meanwhile employment in Canadian aircraft industry is not yet at its post-war peak following completion of remodeled orders for RCAF and CFA. Only remaining job to be delivered is the North Star version as basis of present order in the special price paid for the Force Mission (Aviation Weekly News 27) using Piper & Whitley R-2400 engine instead of the regular Rolls Royce Merlin installation.

Canadair's present production has two new 45 BCAF contract to produce 100 jet fighters of the North American F-86 Sabre design, under license. Contract exceeds \$30 million over three years. While that plant will be powered with General Electric J-40 turbojets of 2100 lb thrust, similar to those used in the American fighter, it is expected that later planes may use the Canadian Avia Canada turboprop powerplant instead.

Canadair is also continuing to test jet space ports for C-47 and DC-6 planes.



TERMINAL OPEN

Argentina's new airport terminal building is the modern architecture which makes the Buenos Aires into a modern city. It is named after Argentina's Minister of Public Works. The new building, built for \$100,000, has a runway length from 7000 to 7100 and 14,000 ft. long and 300 ft. wide.

Overseas Charter Flights Approved

Two certificated airlines and a domestic all-cargo carrier have each been given more than a million dollars worth of trans-Atlantic passenger charters by the Civil Aeronautics Board.

The Civil Aeronautics Board has granted special exceptions to The Flying Tiger Line, Seaboard & Western Airlines and Transocean Air Lines authorizing about 50 secondary flights between June 1 and Sept. 30. Flights will be made in four engine equipment (Boeing DC-4s), and will carry an average of 45-50 passengers.

- **Opposition**—Grounded-Edinburgh, Glasgow and Aberdeen ports will be closed to Europe and Israel at once considerably below the regular lines to the certificated trans-Atlantic airlines. The regular U.S. operators-Pan American Airways, American Overseas Airlines and TWA—had asked CAB to show out all the requests for special exceptions.

But the Board decided the 50 flights would be made in the next 100 days. CAB said that the regular airlines will be able to adjust their schedules to meet the needs of the special flights.

CAB said that most of the people to be served under the special exceptions would not be able to make the trip at all except for the low fares.

The Board said that the U.S. Department of Commerce and the Economic Cooperation Administration had stressed the importance of encouraging travel to Europe, particularly by air.

- **Applications**—Douglas-Six other carriers—Boeing Airlines, S. W. Inc., U.S. Airways, European Atlantic Airlines, Royal Airlines and Airline Transport—had also applied for special exceptions to make flights to Europe this summer. But CAB said it was in the interest of safety to limit its authorization to those companies which own four engine aircraft and have adequate experience with them in trans-Atlantic operations.

Last January, CAB denied Pan American Airways' application to conduct fully Year charter trips to Rome under an agreement with John B. Rossi, as Italian travel organization. The Board found that PAA's proposed flights would be made at a low—secondary—lighter load and pay—the PAA's Rome traffic would not be confined to limited groups.

- **Yank Airline Flights**—Boeing's latest order provide that Youth Agency, a non-profit educational organization sponsoring student travel abroad, may make

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commitments with the Flying Tiger, Seaboard & Western and Transocean for a total of 40 U.S. Europe and U.S.-Asia roundtrips. In addition, Seaboard & Western were authorized to make 71 trans-Atlantic roundtrips and Transocean on roundtrips for other regions, additional, non-profit or charitable groups.

Flights authorized by CAB were far fewer than had been requested by the three exempted carriers. They had applied to make about 107 roundtrips for Youth Airway alone.

The Board noted that low-fare educational, religious and charitable groups which selected an equalized carrier for trans-Atlantic transportation were the new applications for special flights on the three authorized lines. It is believed that approval of total of these requests may boost the total number of special trans-Atlantic group flights scheduled for this summer to about 100.

Warning issued—CAB emphasized that it was not happy over the way some exemptions and board orders had sought to amend up low fare charter business even before applications were filed with the Board for such transoceanic flights. The Federal agency said it granted special exceptions last year because the regularly scheduled operations had not completed their new equipment program, and declared that the Catholic Hike Year to 1950 had created another unusual circumstance, which had to be taken into consideration.

"However," CAB warned, "similar action may not necessarily be taken in future years. Carriers and the traveling public are cautioned not to be lulled into the Board's 1950 action being a precedent." CAB Member Jack Lee cautioned the Board's authority opinion permitting the Flying Tiger to make special trans-Atlantic trips this summer. But he said the same privilege should not be extended to Transocean and Seaboard & Western because CAB enforcement actions are presently pending against these two carriers.

Merger Approved

Final details in the merger of these Racy-McIntosh and McIntosh into a single operating unit have been approved by the Civil Aeronautics Board.

Effective June 1, the temporary certificate of Massachusetts Air Lines, Challenger Airlines and Airway Airways will be terminated in Freetown, Major of Massachusetts and Challenger was approved by CAB last December, and the McIntosh-Airway combination received an official sanction in April (Aeronautics News April 24).

CAB stated the petition of Boston Air Lines, another feeder operator, for consolidation of the Massachusetts Airlines division. Freetown's new route runs nearly 3000 miles from the Montreal border almost to Canada.

Duchess Costs

Sanford Rose, Ltd., Crown, England, faces its new Duchess tailored for cost. These, last year's model, study (Aeronautics News May 18), would offer very attractive dual operating cost characteristics.

On 2000 sq. stage length, cost per hour-mile is estimated at about 21 cents with 14-cent cost for 1500-1500-mile length. Cost per passenger mile is just over one cent on routes of 1500-1500 sq. stage length, and a fraction over 2 cents on a stage distance of 2000 mi.

SHORTLINES

• **Al Frazier**—Completed all New York First flight of its new luxury service, "The Princess", on a weekend stop during the first month of the operation, due to a scheduling conflict at any of the 325 cities, four days, but passengers. Starting May 31, the de luxe Continental flight will run twice weekly.

• **Al American**—This resumed its summer schedule to Cape May, Woodstock, N.J., and Rehoboth Beach, Cal.

• **American-Civil Aeronautics Board** has approved the interlocking relationship resulting from electric of James Bruce as director of Aeronautics Board while serving as a director of American.

• **British European Airways**—Passenger traffic increased 50 percent in the fiscal year ended Mar. 31. Company earned 751,512 pounds on its continental and domestic routes during the year.

• **California Eastern**—Is considering five DG to be used by Overseas National Airways in its charter operations. George W. Thompson, CNA president, says the planes will be available for flights anywhere in the world. CNA has opened a New York office in the Empire State Bldg.

• **Civil Aeronautics Board**—Has amended Part 61 of the Civil Air Regulations to permit a 200-ft. reduction in ceiling for scheduled carriers of alternate airports equipped with a radio range and either ILS or CCA. The Board and Part 61 heretofore had failed to recognize the additional combination of radio aids offered by these routes. CAB has approved an agreement between 27 scheduled airlines providing for a waiver to U.S. military agencies which would permit carrying military personnel at a 10 percent discount during the year ending June 30, 1951.

• **ICAO**—India and Indonesia have become members of the International Civil Aeronautics Organization, bringing total membership to 55 nations.

• **Interstate Commerce Commission**—Estimates the airlines suffered a \$66-million operating deficit on passenger service last year—\$59 million more than in 1949.

• **Northeast**—Early next month plans to merge service to Laramie and Berkeley, N. H.; Brunswick and Rockland, Me., and New London, Conn.

• **Northwest**—CAB has granted NWA a one-year exemption to serve the Chinook National city of Tappah, Formosa, as an intermediate point on the carrier's Pacific route. Request had previously been denied. CAB has suspended pending investigation, NWA's tariff proposing removal of the dipper from its location on its coast flights, which now have terminals during the night.

• **Pan American**—Has received CAB permission to suspend scheduled service on its Boston-Berkeley route except during the peak traffic months of March



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The Johnson-Lee Subsidy Proposals

Most important aspect of Lee's speech was his message

While far from a panacea, the Lee Johnson proposals have strong political backing and considerable popular appeal to the weary taxpayer. With mainstream and other interests stirring public opposition to airline subsidies, the suggestions must be studied seriously.

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ALLISON TURBO-PROP ENGINES POWER NAVY'S GIANT PATROL BOAT TO AN AMERICAN "FIRST"

EQUIPPED with four new Allison T40 Turbo-Prop engines, the Navy's 60-ton XP5Y Convair flying boat chalked up an American first in its maiden flight from the harbor base of the Consolidated Vultee Aircraft Corporation at San Diego, California.

This long-range anti-submarine patrol seaplane is the first American aircraft to fly solely with Turbo-Prop power.

With a total weight of only 10,000 pounds and developing a spectacular 22,000 horsepower, the four Allison twin-turbine engines establish a world's

record in a horsepower-to-engine-weight ratio — 2.2 horsepower for each pound of engine.

The power from one of these T40 Turbo-Props is greater than the total power of all four reciprocating-type engines in a B-17 Flying Fortress, with only a fraction of the piston-type engine weight.

This first flight of the Convair clearly demonstrates revolutionary design advantages, through the use of Allison Turbo-Prop engines, now applicable to all military transport, cargo and commercial aircraft in the high-power field.

Allison

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